FORM PTO-1390 (REV. 11-2000) U.S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY 'S DOCKET NUMBER: BEI 698-WG

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 09/720947

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP99/04539	1 July 1999 (01.07.99)	4 July 1998 (04.07.98) ~~20 March 1999 (20.03.99)~~

TITLE OF INVENTION: Electrically Conductive, Thermoplastic, Heat-Activatable Adhesive Film

APPLICANT(S) FOR DO/EO/US: Ronald Pfaff; and Hans Karl Engeldinger

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [x] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [x] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [x] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [x] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto (required only if not communicated by the International Bureau).
   b. [x] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [x] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [ ] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [x] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [x] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Certified translation

Items 11 to 20 below concern document(s) or information included:

11. [x] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [x] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [x] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [ ] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [x] Other items or information:
    a) Copy of the Cover Page from published application WO/0001782
    b) Copy of International Search Report
    c) Copy of International Preliminary Examination Report
    d) Certified copies of priority documents - German appln.nos. 199 12 628.3 and ~~198 30 021.2~~

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/712947	PCT/EP99/04539	BEI 698-WG

21. ☒ The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1000.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$860.00**	860.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$690.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	11 - 20 =	--	x **$18.00**	$	
Independent claims	3 - 3 =	--	x **$80.00**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$270.00**	$	

TOTAL OF ABOVE CALCULATIONS =	$ 860.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. +	$	
SUBTOTAL =	$ 860.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).	$	
TOTAL NATIONAL FEE =	$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +	$ 40.00	
TOTAL FEES ENCLOSED =	$ 900.00	
	Amount to be refunded:	$
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a. ☐ A check in the amount of $ _____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. 14-1263 in the amount of $ 900.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 14-1263. A duplicate copy of this sheet is enclosed.

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NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

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REGISTRATION NUMBER

CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10) Applicant(s): **Ronald Pfaff, et al.**			Docket No. **BEI 698-WG**
Serial No. 09/720947 **To be Assigned**	Filing Date **To be Assigned**	Examiner **To be Assigned**	Group Art Unit **To be Assigned**

Invention:

Electrically Conductive, Thermoplastic, Heat-activatable Adhesive Film

I hereby certify that this **U.S. national stage patent application of PCT/EP99/04539**
(Identify type of correspondence)

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 in an envelope addressed to: The Commissioner of Patents and Trademarks, Washington, D.C. 20231-0001 on **January 3, 2001**
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PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Atty's Docket No. BEI 698-WG

APPLICANT : Ronald Pfaff, et al.

SERIAL NO. : U.S. national stage application of PCT/EP99/04539

FILED : Concurrently Herewith

FOR : Electrically Conductive, Thermoplastic, Heat-Activatable Adhesive Film

PRELIMINARY AMENDMENT

Hon. Assistant Commissioner of Patents
BOX PCT
Washington, D.C. 20231

Sir:

Prior to examination, please amend the application as follows:

IN THE CLAIMS

Please cancel all of the claims, and substitute the following new claims:

11.(new) Electrically conductive, thermoplastic and heat-activatable adhesive film, comprising

i) a thermoplastic polymer in a proportion of from 30 to 89.9% by weight,

ii) one or more tackifying resins in a proportion of from 5 to 50% by weight and/or

iii) epoxy resins with hardeners, with or without accelerators, in a proportion of from 5 to 40% by weight, and

iv) silver-coated glass beads or silver particles in a proportion of from 0.1 to 40% by weight,

v) where the diameter of the glass beads is at least equal to the thickness of the adhesive film.

12.(new) Adhesive film according to Claim 1, wherein the thermoplastic polymer comprises thermoplastic polyolefins, polyesters, polyurethanes or polyamides or modified rubbers, such as nitrile rubbers in particular.

13. (new) Adhesive film according to Claim 1, wherein the adhesive film is blended with one or more additives.

14. (new) Thermoplastic adhesive film according to Claim 1, wherein the adhesive film has a thickness of from 20 to 500 µm.

15. (new) Thermoplastic adhesive film according to Claim 1, wherein the adhesive film is suitable for hot pressing at temperatures below 120°C.

16. (new) Thermoplastic adhesive film according to Claim 1, wherein the adhesive film has the same dimensions as the module and is in the form of a punched film section.

17. (new) A method for implanting electrical modules in a card body provided with a cutout for accommodating an electronic module which on the first side has a plurality of contact surfaces and on the second side, which is opposite the first side, has an IC chip whose terminals are connected via electrical conductors to the contact surfaces, wherein the adhesive film of claim 1 is used to connect the second side of the module to the card body.

18. (new) A method for structural bonding, wherein the adhesive film of claim 1, with or without subsequent heat-curing, is used for said bonding.

19. (new) The adhesive film of claim 13, wherein said additives are selected from the group consisting of colorants and mineral or organic fillers.

20. (new) The adhesive film of claim 19, wherein said additives are silica, carbon powders, or metal powder.

21. (new) The adhesive film of claim 15, wherein said temperatures are from 80°C to 100°C.

REMARKS

This Preliminary Amendment is being filed to conform the claims to the amendments made under Article 4, to eliminate multiple dependency, and to present the claims in proper idiomatic English.

Favorable action is respectfully solicited.

Respectfully Submitted,

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Description

Electrically conductive, thermoplastic, heat-activatable adhesive film

The invention describes an electrically conductive, thermoplastic and heat-activatable adhesive film as used for the permanent connection of two articles.

Electronic components are becoming ever smaller, which makes their handling and processing ever more difficult. Especially when producing electrical contacts between the components and/or the connections, it is found that conventional soldering can no longer provide simple and cost-effective connection of the corresponding contacts.
The adhesive bonding of electronic components by means of electrically conductive adhesive films is therefore being developed as an alternative.

For the field of electrically conductive adhesive tapes, it is prior art to employ conductive pigments such carbon black, metal powders, ionic compounds and the like in adhesive compositions.
In sufficient quantities, the particles contact one another and the possibility of current flow from particle to particle is provided. The current flow here is not directionally oriented (isotropic); for specific applications, such as electronic switches, contacting of conductors, etc., there is, however, the requirement to achieve electrical conductivity only in the depth direction (z direction) through the adhesive tape, with no conductivity, however, in the two-dimensional extent (x-y plane) of the adhesive film.

In special cases, it is also required/must be ensured that the conductive sites through the adhesive film (in the z direction)

- are distributed homogeneously, so that any sites on the adhesive tape can be used identically and lead to the same results;
- have small cross sections, so that even in the electronics sector conductor tracks lying close together can be selectively connected without the risk of short circuits, and
- are insulated from one another, in that the areas in between are not filled with conductive materials.

The U.S. Patent US 3,475,213 describes randomly distributed spherical particles which consist entirely of a conductive metal or are

provided with an electrically conductive layer. The best results are achieved with particles which are only slightly smaller than the thickness of the film of adhesive composition.

In U.S. patent US 5,300,340, a special production method using a rotating drum is employed to site the electrically conductive particles in the adhesive composition.

Both of the pressure-sensitive adhesive (PSA) tapes described are based on self-adhesive acrylate polymer compositions and are unable to connect two substrates with the strength required for a permanent bond. Connections subject to permanent or repeated stress, such as by tensile, torsional or shear forces, for example, exhibit signs of detachment after just a short time. The reason for this is that, in the cited prior art, the generally low bond strength of the PSA tapes is reduced further by the addition of electrically conducting particles. The joining techniques are therefore inadequate for ensuring a permanent bond in the case of electronic contacts which are subject to mechanical stress.

The particles that are added firstly reduce the bond strength and secondly increase the distance from the adhesive tape to the surface, since the particles project from the surface to a certain extent, which is entirely desirable for improving the electrical conductivity.

In the case of a product structure as described by U.S. Patent US 5,300,340, this feature is deliberately exploited by mixing in relatively large particles having a diameter which is greater than the thickness of the adhesive composition.

Not only do the processes presented above display inadequate bond strengths for electrical contacts subject to mechanical stress, the bonds produced with them can also be parted again, as a result of which manipulations are possible and property rights, especially in the case of sensitive electronic components, can easily be infringed.

Particularly in the case of electronic devices which are small and flexible and are used in an electronic toy or in chip cards, the electrically conducting adhesive bond is frequently not protected by a rigid housing, is required to withstand flexural stresses without loosing the electrical contact, and is susceptible to such manipulation.

The object of the invention is to achieve an effective and permanent bond while simultaneously producing an electrically conductive contact in the case where a carrier element in data carriers or electronic components is bonded with the aid of a heat-activatable adhesive film.

This object is achieved by means of an adhesive film as characterized further in the main claim. The subclaims relate to advantageous developments of the subject matter of the invention.

In accordance with the invention, the electrically conductive, thermoplastic and heat-activatable adhesive film comprises

i) a thermoplastic polymer in a proportion of from 30 to 89.9% by weight,
ii) one or more tackifying resins in a proportion of from 5 to 50% by weight and/or
iii) epoxy resins with hardeners, with or without accelerators, in a proportion of from 5 to 40% by weight, and
iv) silver-coated glass beads or silver particles in a proportion of from 0.1% by weight, very preferably 10% by weight, to 40% by weight.

The adhesive film is a mixture of reactive resins, which crosslink at room temperature and form a three-dimensional polymer network of high strength, and permanently elastic elastomers, which act against embrittlement of the product. The elastomer may preferably be from the group consisting of polyolefins, polyesters, polyurethanes and polyamides or can be a modified rubber, such as nitrile rubber, for example.

The particularly preferred thermoplastic polyurethanes (TPUs) are known reaction products of polyester polyols or polyether polyols and organic diisocyanates such as diphenylmethane diisocyanate. They are composed of predominantly linear macromolecules. Such products are generally obtainable commercially in the form of elastic granules - for example, from Bayer AG under the trade name "Desmocoll".

By combining TPU with selected compatible resins, it is possible to achieve a sufficient reduction in the softening point of the adhesive film, so as to prevent deformation of the card body during the production process. In parallel with this, there is, in fact, an increase in the adhesion. Examples of resins which have been found suitable are certain rosins, hydrocarbon resins and coumarone resins.

Alternatively, the reduction in the softening temperature of the adhesive film can be achieved by combining TPU with selected epoxy resins based on bisphenol A and/or F and a latent hardener. An adhesive film comprising such a system permits aftercuring of the joint, either gradually at room temperature without any further external intervention, or briefly by controlled heat treatment of the cards following production. In this way, it is possible to prevent subsequently non-destructive removal of the chips with criminal intent using, for example, a standard iron.

The chemical crosslinking reaction of the resins brings about high strengths between the adhesive film and the surface to the bonded and achieves a high internal strength in the product.

The addition of these reactive resin/hardener systems also leads to a reduction in the softening temperature of the abovementioned polymers, which has the advantageous effect of reducing their processing temperature and processing rate. The suitable product is a product which is self-adhesive at room temperature or slightly elevated temperatures. When the product is heated, there is a short term reduction in the viscosity, as a result of which the product is able to wet rough surfaces as well.

The beads present in the adhesive film permit conductivity only in the z direction; in the x-y plane, owing to the lack of mutual contact, there is not conductivity.

The compositions for the adhesive film can be varied widely by altering the nature and proportion of the raw materials. Similarly, it is possible to obtain further product properties, such as colour, thermal conductivity or electrical conductivity, for example, by targeted additions of colorants, mineral and/or organic fillers, and/or powders of carbon and/or metal.

The adhesive film preferably has a thickness of from 20 to 500 μm.

The silver particles may consist of pure silver or else may be produced from an alloy, which in that case should contain a considerable proportion of silver in order to ensure conductivity.

References below to (silver-coated) glass beads will be understood by the person skilled in the art as embracing the abovementioned silver particles.

In a first, advantageous embodiment of the invention, the diameter of the silver-coated glass beads is at least equal to the thickness of the adhesive film and may even be somewhat greater than the thickness of the adhesive film to be produced.

In an alternative, advantageous embodiment of the adhesive film, the diameter of the glass beads is between 10 and 20 μm smaller than the thickness of the adhesive film.

Which diameter of the glass beads is chosen in accordance with the invention depends on the particular intended use of the adhesive film.

If the diameter of the glass beads is greater than the adhesive-film thickness, glass beads projecting from the adhesive film may lead to unwanted air inclusions in the joint, which may reduce the bond strength. Under adverse conditions, this may result in the glass beads in an elastic

joint losing contact under mechanical stresses, which can be reestablished only by repeating the pressing operation.

In the case of some applications, therefore, the bond strength is more important than the conductivity. In these cases, bonding must be conducted at high pressure and at elevated pressure. In this specific case, it is possible to omit electrically conductive glass beads projecting from the adhesive film.

The conductive glass beads in this case can be about 10 to 20 μm smaller than the thickness of the adhesive film, so permitting easy attachment and full-area bonding without air inclusions.

Despite this, electrical contact is produced, since under these bonding conditions the viscosity of the adhesive composition is reduced so severely that it is displaced and the thickness of the joint is reduced. This takes place, for example, when adhesively bonding modules in smart cards. In this case, a pressure of 60 N per module and a die temperature of about 200°C are chosen. Under these conditions, the conductive glass beads receive an electrically conductive contact, since the adhesive composition is displaced and is able to escape into a cavity below the chip module.

This is important, for example, when implanting a module in a card having an antenna in the card body.

The adhesive film of the invention can be employed with particular advantage to implant electrical modules into a card body which is provided with a cutout which is intended to accommodate an electronic module having a plurality of contact surfaces on the first side and having on the second side, which is opposite to the first side, an IC chip whose terminals are connected via electrical conductors to the contact surfaces, the adhesive film being used to connect the second side of the module to the card body.

Preferably, in this case, the adhesive film has the same dimensions as the module and is in the form of a punched film section.

Furthermore, it is also possible to use the adhesive film for structural bonding, with or without subsequent heat-curing.

The invention describes an electrically conductive, thermoplastic and heat-activatable adhesive film as used for the permanent connection of two articles. In contrast to adhesive bonds produced with a PSA tape, strengths as required in the construction sector are permanently achieved and are retained even under chemical, thermal or climatic stress.

To produce the adhesive film, the composition forming the film is cast as a solution onto a flexible substrate (release film or release paper)

and is dried, so that the composition can easily be removed again from the substrate.

Following appropriate processing, punched sections or rolls of this adhesive film can be bonded to the adherend substrate (electronic component, module, etc.) at room temperature or at slightly elevated temperature.

The admixed reactive resins should not enter into any chemical reaction even at the slightly elevated temperature. Therefore, the bonding operation need not be carried out as a one-stage process; rather, for the sake of simplicity, it is possible, as with a PSA tape, first to attach the adhesive film to one of the two substrates by lamination at the elevated temperature. Then, in the actual process of hot bonding to the second substrate, the resin cures partly or fully and the bonded joint attains the high bond strength, far above that of PSA systems.

Accordingly, the adhesive film is particularly suitable for hot pressing at temperatures below 120°C, in particular from 80 to 100°C.

In contrast to adhesive pastes or liquid adhesives comprising conductive filler, which are usually suitable only for isotropically conductive connection, however, the adhesive film described does not cure to a brittle film, but instead, owing to the balanced proportion of crosslinker resin and elastic rubber, remains in a viscoelastic state, as a result of which it is able effectively to withstand peel movement and peel stresses in particular. The great advantage of the adhesive film described comes to bear wherever an adhesive bond or fastening and an electrically conductive connection have hitherto been carried out in two separate steps. In the great majority of cases, this also means an increase in the space required for fastening and conductive connection, which in the case of relatively small electronic components is a disadvantage. Furthermore, the separate bonding step requires special equipment and expensive machinery.

The adhesive films of the invention are therefore distinguished by a number of advantages:

- They possess high cohesion and elasticity at room temperature.
- They exhibit high adhesion to the conventional chip card materials such as PVC, PC, PET or ABS, for example.
- They can be activated at below the softening temperature of the card materials.

Furthermore, chip cards whose modules are bonded in with an adhesive film of the invention feature particularly high flexural strength.

This is demonstrated by conducting a long-term flexural test under a constant load cycle in accordance with DIN EN 20 178.

In the text below, a number of examples illustrate the adhesive film of the invention without wishing to restrict the described invention unnecessarily.

Example 1

The following constituents were dissolved in an acetone/methyl ethyl ketone mixture, applied as a solution to a siliconized paper, and then dried.

	Trade name	% by weight
Thermoplastic PU (TPU)	Desmocoll 400	55
Epoxy resin (Bisphenol A)	Rütapox 0164	25
Dicyandiamide	Dyhard 100 S (SKW Trostberg)	5
Silver-coated glass beads	Conductofil 20-60	15

Thickness of the dried adhesive film	µm	58	ASTM D 1000
Weight of the adhesive film	g/m^2	55	ASTM D 1000
Contact resistance	mΩ	3.5	ASTM D 2739
Specific resistance	Ωm	0.30	ASTM D 2739
Bond strength	N/mm^2	10	DIN EN 1465

Example 2

The following constituents were dissolved in an acetone/methyl ethyl ketone mixture, applied as a solution to a siliconized paper, and then dried.

Substance class	% by weight
Nitrile rubber	55
Phenolic resin	29.8
Ageing inhibitor	0.2
Silver-coated glass beads	15

Thickness of the dried adhesive film	µm	59	ASTM D 1000
Weight of the adhesive film	g/m^2	55	ASTM D 1000

Contact resistance	mΩ	3.5	ASTM D 2739
Specific resistance	Ωm	0.32	ASTM D 2739
Bond strength	N/mm^2	7.0	DIN EN 1465

Patent claims

1. Electrically conductive, thermoplastic and heat-activatable adhesive film, comprising

i) a thermoplastic polymer in a proportion of from 30 to 89.9% by weight,

ii) one or more tackifying resins in a proportion of from 5 to 50% by weight and/or

iii) epoxy resins with hardeners, with or without accelerators, in a proportion of from 5 to 40% by weight, and

iv) silver-coated glass beads or silver particles in a proportion of from 0.1 to 40% by weight,

v) where the diameter of the glass beads is at least equal to the thickness of the adhesive film.

2. Adhesive film according to Claim 1, characterized in that the thermoplastic polymer comprises thermoplastic polyolefins, polyesters, polyurethanes or polyamides or modified rubbers, such as nitrile rubbers in particular.

3. Adhesive film according to Claims 1 and 2, characterized in that the adhesive film is blended with one or more additives, such as colorants, mineral or organic fillers, such as silica, carbon powders and metal powders.

4. Thermoplastic adhesive film according to Claims 1 to 3, characterized in that the adhesive film has a thickness of from 20 to 500 μm.

5. Thermoplastic adhesive film according to Claims 1 to 4, characterized in that the adhesive film is suitable for hot pressing at temperatures below 120°C, in particular from 80 to 100°C.

6. Thermoplastic adhesive film according to Claims 1 to 5, characterized in that the adhesive film has the same dimensions as the module and is in the form of a punched film section.

7. Use of an adhesive film according to one of Claims 1 to 6 for implanting electrical modules in a card body provided with a cutout for accommodating an electronic module which on the first side has a plurality of contact surfaces and on the second side, which is opposite the first side, has an IC chip whose terminals are connected via electrical conductors to the contact surfaces, the adhesive film being used to connect the second side of the module to the card body.

8. Use of an adhesive film according to one of Claims 1 to 6 for structural bonding, with or without subsequent heat-curing.

Abstract

Electrically conductive, thermoplastic and heat-activatable adhesive film, comprising

i) a thermoplastic polymer in a proportion of from 30 to 89.9% by weight,

ii) one or more tackifying resins in a proportion of from 5 to 50% by weight and/or

iii) epoxy resins with hardeners, with or without accelerators, in a proportion of from 5 to 40% by weight, and

iv) silver-coated glass beads or silver particles in a proportion of from 0.1 to 40% by weight.

COMBINATION DECLARATION & POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled „electrically conductive, thermoplastic, heat-activatable adhesive film" the specification of which is attached hereto.

-OR-

was filed on _____ as

Application Serial No. _____ and was amended _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed
199 12 628.3 (Number)	Germany (Country)	20/03/1999 (Day/Month/Yr. Filed)	[X] yes [ ] no
198 30 021.2 (Number)	Germany (Country)	04/07/1998 (Day/Month/Yr. Filed)	[X] yes [ ] no

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____	_____	_____
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punished by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named Inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

Arnold Sprung, Reg. No. 17,232; Nathaniel D. Kramer, Reg. No. 25,350; Ira J. Schaefer, Reg. No. 26,802, and Esther Steinhauer, Reg. No. 40,255 all of 120 White Plains Road, Tarrytown, New York 10591; Kurt G. Briscoe, Reg. No. 33,141; William C. Gerstenzang, Reg. No. 27,552; Paul J. Juettner, Reg. No. 20,974 of 660 White Plains Road, New York 10591, my attorneys with full power of substitution and revocation

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Full Name Of Second Inventor	**Inventor's Signature**	**Date**
Hans Karl Engeldinger	Karl Engeldinger	04.06.99
Residence		**Citizenship**
Büchnerweg 5, D-25451 Quickborn DEX		German
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Büchnerweg 5, D-25451 Quickborn		
Full Name Of Third Inventor	**Inventor's Signature**	**Date**
Residence		**Citizenship**
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Full Name Of Fourth Inventor	**Inventor's Signature**	**Date**
Residence		**Citizenship**
Post Office Address		
Full Name Of Fifth Inventor	**Inventor's Signature**	**Date**
Residence		**Citizenship**
Post Office Address		
Full Name Of Sixth Inventor	**Inventor's Signature**	**Date**
Residence		**Citizenship**
Post Office Address		
Full Name Of Seventh Inventor	**Inventor's Signature**	**Date**
Residence		**Citizenship**
Post Office Address		